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ABSTRACT

This study assesses factors that influence use of suburban school grounds for class-time secondary science instructional activities. Special emphases of the study are on determining frequency of use, factors influencing use, and critical factors limiting use. Results from a survey of secondary science teachers at a public school system in-service meeting indicate that teachers favor the use of school ground science activities, but in actuality, little use of school grounds takes place. The hypothesis is offered that the disparity between teacher preference and teaching practice is a consequence of student discipline problems and large class size. (Author/SA)

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FACTORS INFLUENCING THE USE OF SUBURBAN SCHOOL GROUNDS FOR CLASS-TIME SECONDARY SCIENCE INSTRUCTIONAL ACTIVITIES

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ABSTRACT

This study assessed factors influencing use of suburban school grounds for class-time secondary science instructional activities. Specifically addressed were frequency of use, factors influencing use, and critical factors limiting use. Data were collected by grade level with a piloted instrument from a secondary science teacher population (N=174) at a public school system in-service meeting.

Low frequencies were reported: 84.3% of teachers used school grounds four times or less per semester. Twenty-one factors were rated. Mean ratings were calculated and ranked with respect to influence on use of school grounds.

Strongly encouraging factors were: students preference, teacher's background knowledge, teacher's personal preference, and teacher confidence. Neutral factors were: weather/climate, preparation/preplanning, administration policy, school site, curriculum restrictions, materials/supplies, parents concerns, other teachers reactions, allergies/medical problems, and security. Moderately discouraging factors were: safety considerations, space conflicts with Physical Education classes, length of class time (scheduling) and liability of teacher. Strongly discouraging factors were: student discipline, maturity of students, and class size.

The school site, student discipline, class size and length of time were cited in anecdotal comments by 64.6% of the teachers (N=150) as the one most critical factors limiting their use of school grounds.

The most significant finding was that teachers studied favored the use of school ground science activities, but in actuality little use of school grounds took place. It is hypothesized that this disparity between teacher preference and teaching practice was primarily a consequence of student discipline problems and large class size.

Objectives and Rationale for the Study

The outside environment away from the classroom presents a variety of locations for science laboratories. Renner and Stafford (1970, p. 142) remarked that "laboratory is not a place; the halls, the grounds, home, and the bus all represent laboratory opportunities." Off-campus field trips to forests, beaches, parks, museums, etc., are settings for laboratory activities outside the classroom. Swan (1970) and Kahle (1979) have produced planning guides for off-campus field trips which list a large number of necessary details with which the teacher must be concerned; including rescheduling of teachers and students, transportation, food, parental permission, clothing, toilet facilities, routes, equipment, insurance and finance. Logistical elements combined with the extensive time requirements of off-campus field trips minimize their feasibility and frequency. Thus, off-campus field trips, a primary source of outdoor laboratories, are little utilized.

School grounds are another available setting for outside laboratories. The property surrounding school buildings can be used for laboratory instruction. An Educational Facilities Laboratories report (1972, p. 8) stated that "school grounds offer the most accessible facilities for environmental education." Kahle (1979, p. 151) cited three advantages of school grounds versus off-campus outdoor instructional activities: "Students learn by maintaining them," "time is not lost in travelling," and "more frequent use is possible." However available and advantageous school ground outdoor laboratories are said to be, little research has occurred on their utilization. The present study was conducted in order to provide a factual base regarding this utilization. This assessment specifically addressed the questions:

1. What is the extend of use of school grounds for class-time science instructional activities?

2. Which factors influence the use of school grounds for class-time science instructional activities?
3. What are critical factors limiting the use of school grounds for class-time science instructional activities?

Methodology and Design

Discussions with science teachers, administrators, environmental education specialists, teacher educators, and a review of the literature identified twenty-one potential factors as influencing the use of school grounds:

Maturity of students
Space conflicts with Physical Education classes
Class size
School site
Teacher confidence
Curriculum restrictions
Safety considerations
Liability of teacher
Parents concerns
Allergies, medical problems, etc.
Administration policy
Preparation/preplanning
Weather/climate
Student discipline
Materials/supplies
Other teachers' reactions
Security
Teacher's personal preference
Student preference
Teacher's background knowledge
Length of class time (scheduling)

Although these factors were mentioned in the literature and in the discussions with educators no research studies were located regarding the use of school grounds by secondary science teachers. Therefore, this census survey study was designed to investigate the school ground utilization of a secondary science teacher population.

The population studies consisted of science teachers (N=174) from a suburban public system (130,000 students) in the mid-Atlantic United States. Different results might be obtained from teachers in urban or rural schools,

from other regions, or from private schools. The differences might result from fiscal constraints or changing student populations in the county school system studied. Different results might also be obtained from data collected at other times in the school year.

The survey utilized for this study was administered at an October, 1978 in-service meeting. Data were collected from teachers meeting in groups by subject taught. Teachers were instructed to consider in their responses only science instructional activities occurring during class time on school property. Off-campus field trips or extra-curricular activities were excluded from the study. Teachers were given fifteen minutes to complete the survey.

Teachers of seventh grade Life Science, eighth grade Physical Science, ninth grade Earth Science, and tenth through twelfth grade biological and environmental sciences were chosen because their courses of study were judged to be oriented toward outdoor laboratories.

Teachers of tenth through twelfth grade physical science, chemistry, and physics were excluded from the survey because it was judged that these courses were more generally oriented toward indoor labortories.

Assumptions for the study were the following:

1. There were a variety of identifiable factors which influenced the utilization of school grounds for secondary science activities.
2. The factors influencing the utilization of school grounds for secondary science activities were identifiable from written responses with the instrument "Class Time Science in the School Yard" (Appendix A).
3. Teachers rather than administrators or students were those best able to identify the factors influencing the utilization of the school grounds for secondary science activities.

4. Teachers could identify the factors influencing the utilization of school grounds for secondary science activities from their background and experience even if they had not previously considered the problem.

INSTRUMENT AND DATA

Instrument Design

Since no appropriate instrument was located for the study the "Class-Time Science in the School Yard" instrument (Appendix A) was constructed for surveying the teacher population. Four categories of data were sought:
(1) population data which described the teaching setting of the population;
(2) frequency of use data which provided rates of use of school grounds;
(3) influencing factor rating data which determined the type and degree of influence of the twenty-one factors on use of school grounds; and
(4) critical factor data when ascertained the one factor considered by each teacher as most limiting his or her use of school grounds. Critical factors were obtained through anecdotal comments. Factor ratings were calculated from numerical values associated with a Likert-type scale. The scale ranged from "strongly encouraging" to "strongly discouraging" and included "neutral" to exclude forced choice responses. Each factor was rated independently.

A "Mean Factor Rating Interpretation Scale" (see Figure 1) was developed for analyzing factor rating data. Both the scale and the instrument were revised and validated through a pilot study, the literature review, and the critique of science educators.

Figure 1

Interpretation	Mean Factor Rating ($\bar{X}$)
"Strongly encouraging"	$\bar{X} \geq 0.95$
"Moderately encouraging"	$0.95 > \bar{X} \geq 0.50$
"Neutral"	$0.50 > \bar{X} \geq -0.50$
"Moderately discouraging"	$-0.50 > \bar{X} \geq -0.95$
"Strongly discouraging"	$-0.95 > \bar{X}$

Figure 1. Mean Factor Rating Interpretation Scale

Data were collected anonymously at a secondary science in-service meeting of a large public school system in the mid-Atlantic United States. Collection occurred while the teachers (N=174) were grouped in sub-meetings according to subjects taught. The study population included teachers of seventh grade Life Science (11.5%), eighth grade Physical Science (23.6%), ninth grade Earth Science (25.9%) and tenth through twelfth grade Biological and Environmental Sciences (39.0%). Teachers were classified in the study by the sub-meetings they attended.

Teachers of all grade levels reported mean class sizes of 30 students. The majority of the teachers reported their schools to have suburban locations, with the remainder reporting either urban or rural locations. Junior high school teachers reported a mean school size of 857 students. The senior high school teachers reported a mean school size of 1,828 students.

Frequency of Use Analysis

Table 1 and Figure 2 exhibit the frequencies reported by teachers of school ground use for instructional activities. The overall frequencies reported were

greatest for the seventh grade teachers, with 35% using the school grounds between five and eight times per semester. Eighth grade teacher frequencies were the lowest reported with 79% using the school grounds zero or one time per semester.

Tenth through twelfth grade teachers reported the highest percentage (10.3%) in the high frequency categories of nine times or greater per semester.

The composite analysis indicated that 84.3% of the teachers surveyed used the school grounds between two and four times per semester or less.

Table 1

Frequencies of Use of School Grounds Per Semester for Class-Time Secondary Science Instructional Activities by Grade Level

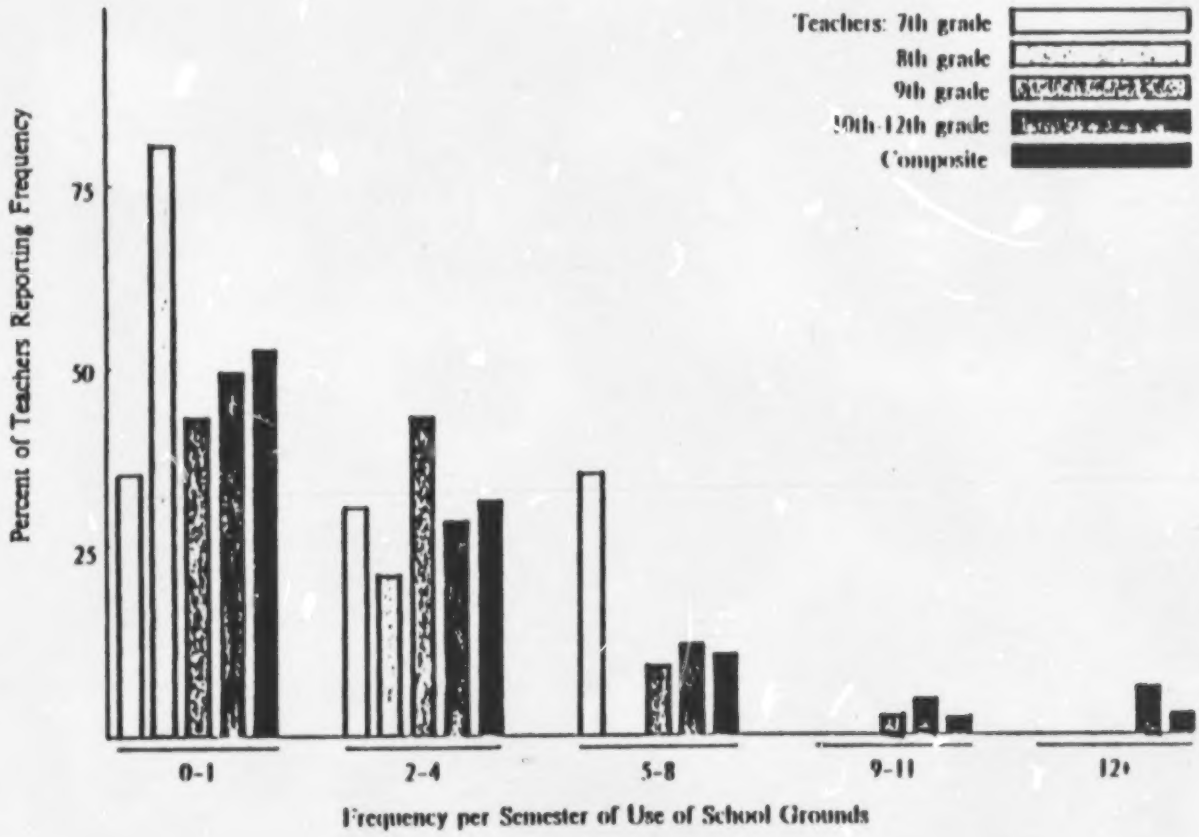
	0-1		2-4		5-8		9-11		>11	
	No.	%	No.	%	No.	%	No.	%	No.	%
7th Grade Teachers	7	(35.0)	6	(30.0)	7	(35.0)	0	(0)	0	(0)
8th Grade Teachers	31	(79.0)	8	(21.0)	0	(0)	0	(0)	0	(0)
9th Grade Teachers	20	(44.4)	20	(44.4)	4	(8.8)	1	(2.2)	0	(0)
10th-12th Grade Teachers	34	(50.0)	19	(27.9)	8	(11.8)	3	(4.4)	4	(5.9)
Composite	92	(53.5)	53	(30.8)	19	(11.0)	4	(2.3)	4	(2.3)

Influencing Factor Rating Analysis

Table 2 presents the seventh grade teachers' mean ratings and standard deviations of IFs ranked in decreasing order of encouragement. Four factors were found to be strongly encouraging to the use of outdoor instructional activities: student preference, teachers' personal preference, teachers' background knowledge, and teachers' confidence.

Six factors were found to be moderately discouraging: safety considerations, space conflicts with Physical Education classes, security, student discipline,

Figure 2 Comparisons of Frequencies per Semester of Use of School Grounds for Class-time Science Instructional Activities



liability of teacher, and maturity of students. Two factors were found to be strongly discouraging: length of class time (scheduling), and class size. The factors with greatest variation in responses were the school site (σ=2.1), and materials/supplies (σ=2.0).

Table 2

Seventh Grade Teachers' Mean Ratings and Standard Deviations of Influencing Factors Ranked from Most Strongly Encouraging to Most Strongly Discouraging

Factor	$\bar{X}$	σ
Student preference	1.73	(1.4)
Teachers' personal preference	1.21	(1.5)
Teachers' background knowledge	1.21	(1.7)
Teachers' confidence	1.10	(1.7)
Curriculum restrictions	0.32	(1.8)
Preparation/preplanning	0.30	(1.4)
School site	0.30	(2.1)
Administration policy	0.00	(1.3)
Weather/climate	-0.10	(1.6)
Materials/supplies	-0.30	(2.0)
Parents concerns	-0.35	(1.6)
Other teachers' reactions	-0.38	(1.0)
Allergies, medical problems, etc.	-0.40	(1.2)
Safety considerations	-0.60	(1.7)
Space conflicts with P.E. classes	-0.70	(1.8)
Security	-0.75	(1.6)
Student discipline	-0.84	(1.7)
Liability of teacher	-0.89	(1.8)
Maturity of students	-0.95	(1.7)
Length of class time (scheduling)	-1.20	(1.3)
Class size	-1.30	(1.8)

Table 3 displays the eight grade teachers' mean ratings and standard deviations of IFs ranked in decreasing order of encouragement. Two factors were found to be strongly encouraging: student preference and teachers' background knowledge. Teachers' preference and teachers' confidence were moderately encouraging.

Six factors were moderately discouraging: security, space conflicts with Physical Education classes, curriculum restrictions, length of class time

Table 3

Eighth Grade Teachers' Mean Ratings and Standard Deviations of Influencing Factors Ranked from Most Strongly Encouraging to Most Strongly Discouraging

Factor	$\bar{X}$	σ
Student preference	1.49	(1.4)
Teachers' background knowledge	0.98	(1.7)
Teachers' personal preference	0.90	(1.5)
Teachers' confidence	0.60	(1.3)
Weather/climate	0.45	(1.1)
School site	0.08	(1.5)
Preparation/preplanning	-0.03	(1.4)
Administration policy	-0.05	(1.2)
Parents concerns	-0.23	(1.1)
Materials/supplies	-0.31	(1.0)
Allergies, medical problems, etc.	-0.41	(0.9)
Other teachers' reactions	-0.45	(1.2)
Security	-0.51	(1.1)
Space conflicts with P.E. classes	-0.58	(1.4)
Curriculum restrictions	-0.59	(1.3)
Length of class time (scheduling)	-0.68	(1.0)
Liability of teacher	-0.70	(1.3)
Safety considerations	-0.95	(1.1)
Student discipline	-1.25	(1.7)
Class size	-1.33	(1.3)
Maturity of students	-1.35	(1.5)

(scheduling), liability of teachers, and safety considerations. Three factors were found to be strongly discouraging: student discipline, class size, and maturity of students.

Table 4 shows the ninth grade teachers' mean ratings and standard deviations of IFs ranked in decreasing order of encouragement. Three factors were strongly encouraging: student preference, teachers' personal preference, and teachers' background knowledge. Only teacher confidence was moderately encouraging.

Table 4

Ninth Grade Teachers' Mean Ratings and Standard Deviations of Influencing Factors Ranked from Most Strongly Encouraging to Most Strongly Discouraging

Factor	$\bar{X}$	σ
Student preference	1.64	(1.4)
Teachers' personal preference	1.00	(1.7)
Teachers' background knowledge	1.00	(1.9)
Teachers' confidence	0.69	(1.7)
Administration policy	0.41	(1.5)
Weather/climate	0.41	(1.8)
School site	0.36	(1.6)
Curriculum restrictions	0.33	(1.4)
Preparation/preplanning	0.25	(1.5)
Materials/supplies	0.21	(1.6)
Parents concerns	0.07	(0.7)
Length of class time (scheduling)	-0.09	(1.6)
Allergies, medical problems, etc.	-0.27	(0.8)
Safety considerations	-0.31	(1.4)
Other teachers' reactions	-0.47	(1.4)
Space conflicts with P.E. classes	-0.56	(1.6)
Liability of teacher	-0.62	(1.5)
Security	-0.69	(1.0)
Class size	-0.84	(1.9)
Maturity of students	-1.22	(1.4)
Student discipline	-1.30	(1.8)

Four factors were moderately discouraging: space conflicts with Physical Education classes, liability of teacher, security, and class size. Maturity of students and student discipline were strongly discouraging factors.

Table 5 presents the tenth through twelfth grade teachers' mean ratings and standard deviations of IFs ranked in decreasing order of encouragement. Four factors were found to be strongly encouraging: student preference, teachers' background knowledge, teachers' personal preference, and teacher confidence. Only preparation/preplanning was moderatley encouraging.

Table 5

Tenth Through Twelfth Grade Teachers' Mean Ratings and Standard Deviations of Influencing Factors Ranked from Most Strongly Encouraging to Most Strongly Discouraging

Factor	$\bar{X}$	σ
Student preference	1.60	(1.2)
Teachers' background knowledge	1.53	(1.4)
Teachers' personal preference	1.30	(1.6)
Teachers' confidence	1.15	(1.4)
Preparation/preplanning	0.53	(1.5)
Weather/climate	0.42	(1.6)
Administration policy	0.40	(1.5)
Curriculum restrictions	0.19	(1.3)
Security	0.14	(1.4)
Other teacher's reactions	0.08	(1.2)
Materials/supplies	0.08	(1.5)
School site	0.03	(2.2)
Parents concerns	0.00	(1.1)
Allergies, medical problems, etc.	-0.15	(1.1)
Safety considerations	-0.36	(1.5)
Space conflicts with P.E. classes	-0.40	(1.5)
Liability of teacher	-0.53	(1.8)
Maturity of students	-0.64	(1.7)
Length of class time (scheduling)	-0.71	(1.7)
Student discipline	-0.74	(1.9)
Class size	-1.29	(1.4)

Four factors were moderately discouraging: liability of teacher, maturity of students, length of class time (scheduling), and student discipline. Only class size was strongly discouraging. Responses to school site had a very large deviation (σ=2.2).

Table 6 gives a composite analysis of all teachers' mean rating of IFs ranked in decreasing order of encouragement. Four factors were found to be strongly encouraging: student preference, teachers' background knowledge,

Table 6

Composite Analysis of Teachers' Mean Ratings and Standard Deviations of Influencing Factors Ranked from Most Strongly Encouraging to Most Strongly Discouraging

Factor	$\bar{X}$	σ
Student preference	1.6	(1.3)
Teachers' background knowledge	1.20	(1.6)
Teachers' personal preference	1.11	(1.6)
Teachers' confidence	0.95	(1.7)
Weather/climate	0.36	(1.5)
Preparation/preplanning	0.31	(1.5)
Administration policy	0.26	(1.4)
School site	0.14	(1.9)
Curriculum restrictions	0.06	(1.4)
Materials/supplies	-0.02	(1.5)
Parents concerns	-0.08	(1.1)
Other teachers' reactions	-0.22	(1.3)
Allergies, medical problems, etc.	-0.27	(1.0)
Security	-0.33	(1.3)
Safety considerations	-0.51	(1.4)
Space conflicts with P.E. classes	-0.52	(1.5)
Length of class time (scheduling)	-0.60	(1.5)
Liability of Teachers	-0.65	(1.6)
Student discipline	-1.00	(1.8)
Maturity of students	-1.00	(1.6)
Class size	-1.18	(1.6)

teachers' personal preference, and teacher confidence. Four factors were moderately discouraging: safety considerations, space conflicts with Physical Education classes, length of class time (scheduling) and liability of teachers.

Three factors were strongly discouraging: student discipline, maturity of students, and class size. The variation of responses to school site (σ=1.9) was greater than for any other factor.

Critical Factor Analysis

In this section the critical factors cited by teachers (N=150) as most limiting their use of the school grounds for instructional activities is reported. Tables 7 through 10 present grade level analysis and Table 11 presents composite analysis for all participants in the study. Figure 3 (A-O) graphically presents individual critical factors across grade levels and composite.

Table 7 presents the critical factor cited by each seventh grade teacher. Class size and student discipline were reported by 16.5% of the teachers. Teachers' background knowledge and length of class time were cited by 11.1% of the teachers. Eight other factors were stated by the remaining teachers to be critical in limiting their use of school grounds; preparation/preplanning, weather/climate, security, teachers' personal preference, school site, curriculum restrictions, liability of teachers, and space conflicts with Physical Education classes.

Figure 3. Comparisons of Critical Factors Cited by Teachers as Limiting their Use of School Grounds for Class-time Science Instructional Activities

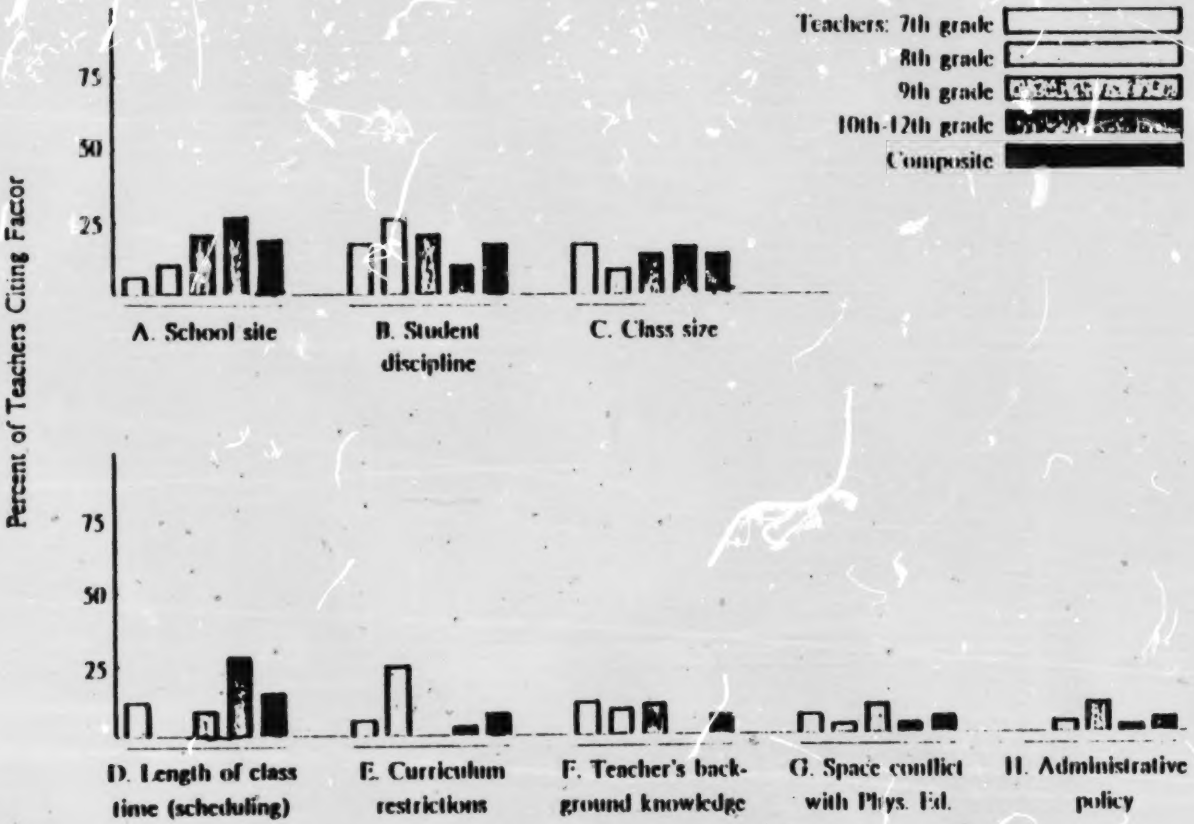


Figure 3 continued
Comparisons of Critical Factors Cited by Teachers
as Limiting their Use of School Grounds for Class-time Science Instructional Activities

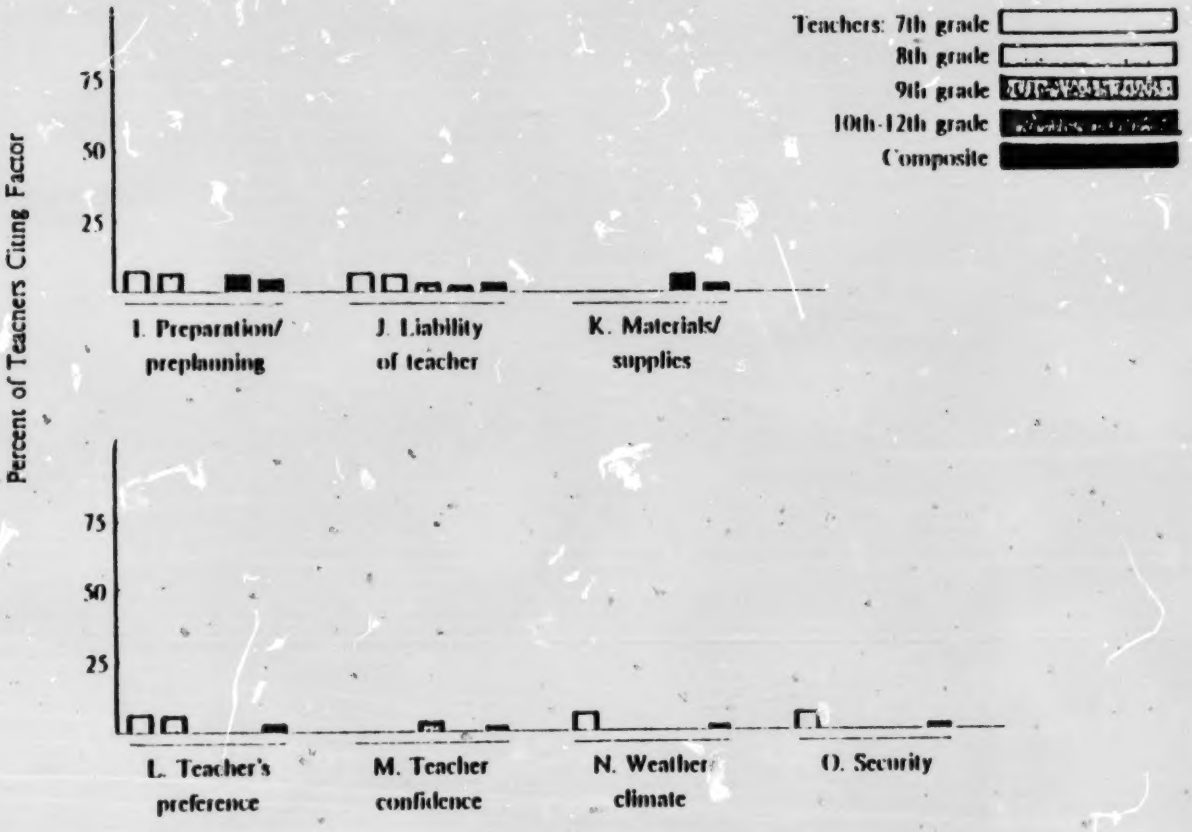


Table 7

Critical Factors Cited by Seventh Grade Teachers as Limiting Their Use of the School Grounds for Class-Time Science Instructional Activities

Critical Factors	Number	Percent
Class size	3	(16.5)
Student discipline	3	(16.5)
Teachers' background knowledge	2	(11.1)
Length of class time (scheduling)	2	(11.1)
Preparation/preplanning	1	(5.6)
Weather/climate	1	(5.6)
Security	1	(5.6)
Teachers' personal preference	1	(5.6)
School site	1	(5.6)
Curriculum restrictions	1	(5.6)
Liability of teacher	1	(5.6)
Space conflicts with P.E. classes	1	(5.6)
Total Number of Teachers Reporting	18	(100.0)

Table 8 presents the critical factor cited by each eighth grade teacher. Student discipline was reported by 27.1% of the teachers. Another 24.3% noted curriculum restrictions as critically limiting their use of school grounds. The school site was reported by 10.8% of eighth grade teachers. Class size and teachers' background knowledge were cited by 8.1% A variety of five other factors were determined to be critical by the remaining teachers; teachers' personal preference, liability of teacher, preparation/preplanning, administration policy, and space conflicts with Physical Education classes.

Table 8

Critical Factors Cited by Eighth Grade Teachers as Limiting Their Use of the School Grounds for Class-Time Science Instructional Activities

Critical Factors	Number	Percent
Student discipline	10	(27.1)
Curriculum restrictions	9	(24.3)
School site	4	(10.8)
Class size	3	(8.1)
Teachers' background knowledge	3	(8.1)
Teachers' personal preference	2	(5.4)
Liability of teacher	2	(5.4)
Preparation/preplanning	2	(5.4)
Administration policy	1	(2.7)
Space conflicts with P.E. classes	1	(2.7)
Total Number of Teachers Reporting	37	(100.0)

Table 9 presents the critical factor cited by each ninth grade teacher. Student discipline and the school site were reported by 21.6% of the teachers. Class size was cited by another 13.6%. Teachers' background knowledge and administration policy were noted by 10.8 % of the teachers each. The remaining participants in the ninth grade group determined a variety of four other factors to be critically limiting to their use of school grounds; space conflicts with Physical Education classes, length of class time (scheduling), teacher confidence and teacher liability.

Table 9

Critical Factors Cited by Ninth Grade Teachers as Limiting Their Use of the School Grounds for Class-Time Science Instructional Activities

Critical Factors	Number	Percent
Student discipline	8	(21.6)
School site	8	(21.6)
Class size	5	(13.6)

Table 9 continued

Critical Factors	Number	Percent
Teachers' background knowledge	4	(10.8)
Administration policy	4	(10.8)
Space conflicts with P.E. classes	3	(8.1)
Length of class time (scheduling)	3	(8.1)
Teacher confidence	1	(2.7)
Teacher liability	1	(2.7)
Total Number of Teachers Reporting	37	(100.0)

Table 10 presents the critical factor cited by each tenth through twelfth grade teacher. Length of class time and school site were each reported by 27.6% of the teachers. Class size was cited by 17.2%. Student discipline was noted as critically limiting by 8.7% of this grade level group of participants. Six other factors were stated by the remaining teachers; materials/supplies, preparation/preplanning, space conflicts with Physical Education classes, administration policy, curriculum restriction, and liability of teachers.

Table 10

Critical Factors Cited by Tenth Through Twelfth Grade Teachers as Limiting Their Use of the School Grounds for Class-Time Science Instructional Activities

Critical Factors	Number	Percent
Length of class time (scheduling)	16	(27.6)
School site	16	(27.6)
Class size	10	(17.2)
Student discipline	5	(8.7)
Materials/supplies	3	(5.2)
Preparation/preplanning	3	(5.2)
Space conflicts with P.E. classes	2	(3.4)

Table 10 continued

Critical Factors	Number	Percent
Administration policy	1	(1.7)
Curriculum restrictions	1	(1.7)
Liability of teacher	1	(1.7)
Total Number of Teachers Reporting	58	(100.0)

Table 11 presents the critical factor cited by a composite of all participants reporting (N=150). The school site was the factor most frequently determined (19.3% of the teachers) to be critically limiting to the use of school grounds for science instructional activities. Student discipline was cited by 17.3% of the participants. Class size and length of class time were reported by 14.0% of the teachers each. A variety of eleven other factors were stated as critically limiting by the remaining teachers reporting; curriculum restrictions, teachers' background knowledge, space conflict with Physical Education classes, administration policy, preparation/preplanning, liability of teacher, materials/supplies, teachers' personal preference, teacher confidence, weather/climate and security.

Table 11

Composite of Critical Factors Cited by Teachers Limiting Their Use of the School Grounds for Class-Time Science Instructional Activities

Critical Factors	Number	Percent
School site	29	(19.3)
Student discipline	26	(17.3)
Class size	21	(14.0)
Length of class time (scheduling)	21	(14.0)
Curriculum restrictions	11	(7.3)
Teachers' background knowledge	9	(6.0)
Space conflict with P.E. classes	7	(4.7)

Table 11 continued

Critical Factors	Number	Percent
Administration policy	6	(4.0)
Preparation/preplanning	6	(4.0)
Liability of teacher	5	(3.3)
Materials/supplies	3	(2.0)
Teachers' personal preference	3	(2.0)
Teacher confidence	1	(0.7)
Weather/climate	1	(0.7)
Security	1	(0.7)
Total Number of Teachers Reporting	150	(100.0)

Results and Conclusions

From the analysis of the data it is concluded that seventh grade Life Science teachers had the highest frequencies of use of school grounds overall and the eighth grade had the lowest frequencies of use. Hug (1964) found that grade level had no influence of the frequency of use of school grounds for elementary school instructional activities. The present investigation found that there were differences in frequency of school ground use among grade levels in the school system studied.

Analysis of frequencies indicated low rates of use of school grounds for class-time science instructional activities with 84.3% of all teachers reporting use rates of four times or less per semester, including 53.5% who used school grounds zero or one time per semester.

Mean factor ratings and standard deviations were calculated for each grade level and from a composite analysis of all teachers. The mean ratings were analyzed using the "Mean Factor Rating Interpretation Scale" (see Figure 2) and the factors were ranked from "strongly encouraging" to "strongly discouraging."

The study found four influencing factors (IFs) that were strongly encouraging to the use of school grounds for science instructional activities: student preference, teachers' background knowledge, teachers' personal preference, and teachers' confidence.

Student preference had the highest mean rating of all IFs for all grade levels, as teachers indicated that students generally favored school ground science activities. The grade level teachers with the highest overall frequency of use of school grounds, the seventh grade, indicated the highest mean rating for student preference of all grade levels of factors. The tenth through twelfth grade teachers' mean rating contained the lowest variation of all grade levels of teachers.

Teachers background knowledge was a strongly encouraging IF for all grade levels. Seventh grade Life Science teachers had the highest mean ratings of the junior high school grades (seventh through ninth) and the senior high (tenth through twelfth grades) teachers had the highest ratings of all grades. Lower mean ratings of eighth and ninth grade teachers may reflect the biological science backgrounds of some secondary science teachers who instruct Earth or Physical Science and are less familiar with outdoor study techniques appropriate to these disciplines than biological field-study techniques. The responses of ninth grade teachers contained the greatest variability.

Teachers' personal preference was a strongly encouraging IF for all but the eighth grade Physical Science teachers who reported a moderately encouraging mean rating. Again as with the previous IF the Life Science teachers had the highest mean ratings of the junior high school grades and the senior high school grades had the highest ratings of all grades. Teachers' stated preferences were congruent with stated level of their

background knowledge. The greatest variability of all grade level teachers' response to this IF was found in the ninth grade teachers' ratings.

Teacher confidence was rated as strongly encouraging in the composite analysis and by the seventh and tenth through twelfth grade teachers. The eighth and ninth grade teachers rated this IF moderately encouraging. Eighth grade teachers were least confident of all grade levels of teachers as they reported the lowest mean rating which also contained the least variation of all grade level teachers mean ratings.

The investigator concluded that these four strongly encouraging factors were indicative of human motivation and showed that there was interest in the use of school grounds by teachers of all grade levels. Of these IFs, only teacher confidence was not hypothesized to be strongly encouraging and had an unexpectedly high mean rating.

This study found that ten factors were neutral in their influence: weather/climate, preparation/preplanning, administration policy, school site, curriculum restrictions, materials/supplies, parents concerns, other teachers' reactions, allergies, medical problems, etc. and security.

The school site was rated as neutral by all grades. The ninth grade teachers reported the highest mean rating, perhaps due to the many Earth Science outdoor laboratories with minimal site requirements. Variation in responses yielded larger standard deviations for this IF than for any other factor in the seventh and tenth through twelfth grades. This variation may reflect school sites which differ in their usefulness for outdoor instructional activities for biology courses within the school system studied.

Curriculum restrictions were rated as neutral in the composite analysis and by all grade level teachers except the eighth, for whom it was moderately

discouraging. Fewer school ground instructional activities have been developed for eighth grade Physical Sciences than for the other science subjects included in the study. Many biologically oriented activities are known to Life Science, Biology and environmental science teachers, and the Earth Science curriculum also provide opportunities for frequent school ground activities.

Parents concerns and allergies, medical problems, etc. were rated as as neutral IFs by all grade levels of teachers. The ratings were progressively more encouraging as grade level increased. Security was a neutral IF in the composite analysis due to the influence of the tenth through twelfth grade teachers' ratings. All other grades rated security as moderately discouraging with the seventh grade teachers reporting the lowest mean rating. The three IFs, security, parents concerns, and allergies, medical problems, etc., were rated as more discouraging by the teachers of the younger students than the teachers of older students. This trend may be due to the ability of older students to be responsible for their own welfare.

Four factors were determined to be moderately discouraging: safety considerations, space conflicts with Physical Education classes, length of class time (scheduling) and liability of teachers.

Safety considerations were moderately discouraging in the seventh and eighth grade teachers' factor ratings. The ninth and tenth through twelfth grades reported safety considerations as neutral. The eighth grade teachers were most concerned about this factor compared to other grades.

Space conflict with Physical Education classes were rated as moderately discouraging IFs by all junior high school grade teachers, with the seventh grade teachers having the most conflicts.

Length of class time (scheduling) was rated as moderately discouraging by all grade level teachers except the most frequent users of school grounds, the seventh, who reported it as strongly discouraging. Outdoor instructional activities require a high level of organization and can be challenging to accomplish in the typical forty-five minute class period. Time must be carefully allocated for taking attendance, orientation to task, travel, the activity, closure and dismissal, as well as reorganization of materials for the next class period.

Liability of teachers was rated as moderately discouraging by all grades. Ratings were less discouraging as grade levels increased. Teachers studied were aware of potential litigation as a professional problem.

Three of these four moderately discouraging factors were incorrectly hypothesized to be strongly discouraging based on the pilot study: safety considerations, liability of teachers, and length of class time (scheduling).

Three factors were determined to be strongly discouraging as hypothesized: student discipline, maturity of students, and class size.

Student discipline was rated as a strongly discouraging IF in the composite analysis and by the eighth and ninth grade teachers. The seventh and tenth through twelfth grade teachers rated student discipline as only moderately discouraging.

The teachers who used the school grounds frequently rated discipline as less discouraging than those who did not use the school grounds frequently.

Maturity of students was rated in the composite analysis and by the eighth and ninth grade teachers as strongly discouraging. Seventh and tenth through twelfth grade teachers reported this IF as only moderately discouraging. As with student discipline, maturity of students was rated as more discouraging by those teachers with the lower frequencies of use.

Class size was rated as strongly discouraging in the composite analysis and by all grade levels of teachers except the ninth for whom it was moderately discouraging.

The Earth Science curriculum for ninth grade includes outdoor laboratories designed for teams of students which are highly structured with materials and supplies available. Because of this, class size was less discouraging for the ninth grade teachers than for the others.

A critical factor was what each teacher judged as most limiting his or her use of school grounds. Most frequently cited by seventh grade teachers were class size and student discipline (16.5% each), by eighth grade teachers were student discipline (27.1%) and curriculum restrictions (24.3%) by ninth grade teachers were student discipline and the school site (21.6% each)m by tenth through twelfth grade teachers were length of class time (scheduling) and the school site (27.6% each). Analysis of the critical factors of all teachers showed that four totaled 64.6% of all responses (N=150): school site (19.3%), student discipline (17.3%) class size (14.0%) and length of class time (scheduling) (14.0%). All of these except class size were hypothesized as critical factors based on the pilot study.

Two of these critical factors, student discipline and class size were also ranked as the two most strongly discouraging IFs. Both discipline and class size are not specifically related to school ground instructional activities, but rather are of a general nature. The investigator's speculations on the significance of these two factors for education follow in the next section.

SIGNIFICANCE

Analyses of the results indicated that the background knowledge, confidence, and personal preference of the population studied favored the utilization of school ground instructional activities. However, little use was made of school grounds as the frequency data demonstrated. Why then was there this disparity between preference and practice? It is hypothesized that this disparity was primarily a consequence of student discipline and large class size. These factors inhibited teachers' ability to choose school ground instructional techniques. The selection of pedogogical strategies ought to have been based on educational objectives rather than extraneous circumstances. Furthermore, if discipline problems and class size were able to inhibit the use of one teaching strategy, then the same factors might limit other teaching strategies.

This study was a census survey of a particular science teacher population and utilized descriptive statistical techniques. No claim can be made of generalizability. However, certain congruent findings of the "Nationwide Teacher Opinion Poll - 1979" (1979) conducted by the National Education Association are appropriately mentioned here. This poll of 1,777 public school teachers found, with a ninety-five percent confidence interval, that three fourths (74%) of teachers say discipline problems impair their effectiveness to teach. Nearly one-half (46%) think that their school administration has not done nearly enough to help teachers with discipline problems.

The problems of class size and discipline in the schools may result from interactions between economic pressures and societal disequilibrium. Rapid inflation and decreasing purchasing power impact upon the students, families, and the school systems.

The economic impacts on families result in tight family budgets and multiple incomes are increasingly necessary to keep up with inflation.

With parents spending more time at work and less time at home children receive less parental supervision, leading to less discipline which is reflected in classroom misbehavior. Families may not want the increased taxes necessary to maintain current educational services and class size in times of rising costs. In fact, constraints in government spending are demanded which result in smaller school system budgets, decreased services and larger class size. The larger class size and related discipline problems makes public schools less attractive to parents seeking high quality education for their children. More families which are able send their children to private schools. The public school system thus may lose community support as well as state funding which is based on the number of students. Decreased state funding can drive class sizes ever higher.

Increased class size and curtailed or eliminated curricular or extracurricular programs result in fewer student needs being met. Lowered morale and boredom lead to disruptive behavior and discipline problems. Because of discipline problems and larger class size, more time may be consumed in disciplinary matters and less time on education.

The pervasive discipline problems prevalent in school systems today can be viewed as a special case of societal disequilibrium. A social system consists of interdependent members and their relationships. Within a social system "norms govern a set of expectations about how the typical occupant of a given position...is supposed to behave" (Kiesler & Kiesler, 1969, p. 36). Norms define the range of acceptable behaviors. Members of the social system whose behavior exceeds the norms and who act unacceptably are called "deviants." "A 'society'...is in equilibrium when reactions to members who are 'deviants' from the norms of role behavior will be such as to bring

them back into the more or less straight and narrow path" (Emmett, 1972, p. 73).

Social disequilibrium results from the failure of the members of the system to react in a way that corrects deviant behavior. The members of the social system are students, parents, teachers, principals, the central administration, the school board and the rest of society. Disequilibrium exists when class room disruption persists uncorrected to the detriment of the system. This uncorrected state is a consequence of the failure of the members to act in harmony to re-establish equilibrium.

The failure of the system to re-establish equilibrium is due to changing norms. When norms are in a state of flux, there is no predictability or shared expectations of the response by one member to the action of another. For example, if a student's behavior is disruptive and exceeds the norm, a teacher cannot take corrective actions with the expectation that there will be a positive predictable response from parents, principals, central administrators, or other members of the social system. Because there is no coordinated response by the members of the social system, there are no effective deterrents to disruptive behavior. Economic pressures and social disequilibrium contribute to the problems of class size and student discipline to undermine the proper functioning of the educational system.

APPENDIX A

SURVEY
CLASS TIME SCIENCE IN THE SCHOOL YARD

SURVEY

Class Time Science in the School Yard

Note: Please do not consider field trips off school property or before or after school activities in your responses. Please just consider class time school yard activities.

Part A

1. Type of school, public or private (circle one)
2. Subject(s) and Grade(s) taught

   _____ _____
   _____ _____
   _____ _____
   _____ _____

3. Average class size _____
4. School location - Urban—Rural—Suburban (circle one)
5. Approximate student total in your school _____
6. How often do you take your students outside in class time to teach science? (per semester) A. 0 to 1, B. 2 to 4, C. 5 to 8, D. 9 to 11, E. more frequently Specify_____

Part B

Please rate the following factors 3 to -3 as to whether each encourages (+) or discourages (-) your use of the school yard in class time. (Circle one number.)

	Encourages			Neutral	Discourages		
	Strongly	Mod.	Slightly		Slightly	Mod.	Strongly
1. Administration policy	3	2	1	0	-1	-2	-3
2. Preparation/preplanning	3	2	1	0	-1	-2	-3
3. Weather/climate	3	2	1	0	-1	-2	-3
4. Student discipline	3	2	1	0	-1	-2	-3
5. Materials/supplies	3	2	1	0	-1	-2	-3
6. Other teacher's reactions	3	2	1	0	-1	-2	-3
7. Security	3	2	1	0	-1	-2	-3
8. Teacher's personal preference	3	2	1	0	-1	-2	-3
9. Student preference	3	2	1	0	-1	-2	-3
10. Teacher's background knowledge	3	2	1	0	-1	-2	-3
11. Length of class time (scheduling)	3	2	1	0	-1	-2	-3
12. Maturity of students	3	2	1	0	-1	-2	-3
13. Space conflicts with Physical Ed. classes	3	2	1	0	-1	-2	-3
14. Class size	3	2	1	0	-1	-2	-3
15. School site	3	2	1	0	-1	-2	-3
16. Teacher confidence	3	2	1	0	-1	-2	-3
17. Curriculum restrictions	3	2	1	0	-1	-2	-3
18. Safety considerations	3	2	1	0	-1	-2	-3
19. Liability of teacher	3	2	1	0	-1	-2	-3
20. Parents concerns	3	2	1	0	-1	-2	-3
21. Allergies, medical problems, etc.	3	2	1	0	-1	-2	-3

Part C

Please cite and briefly discuss the major critical factor which limits your use of the school property for class time science activities._____

_____

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